Lesson 3: Understanding General Software Development

1. Arrange the various activities of an application lifecycle in the order in which they are likely to occur.
a) Requirements analysis, design, coding, testing, and release
b) Design, requirements analysis, coding, testing, and release
c) Release, requirements analysis, coding, testing, and design
d) Requirements analysis, design, release, coding, and testing

Answer: a
Difficulty: Easy
Section Reference: Understanding Application Lifecycle Management
The activities of an application lifecycle are likely to take place in the following order: requirements analysis, design, coding, testing, and release.

2. You are planning to develop a new software system for your organization. You need to review the plans, models, and architecture for how the software will be implemented. Of which of the following activities should you review the output?
a) requirements analysis
b) design
c) coding
d) testing

Answer: b
Difficulty: Medium
Section Reference: Understanding Application Lifecycle Management
The design activity is used to create plans, models, and architecture for how the software will be implemented.

3. You are planning to develop a new software system for your organization. You need to review the system's technical blueprint. Which of the following participants is responsible for providing the technical blueprint?
a) user interface designer
b) developer
c) architect
d) technical writer

Answer: c
Difficulty: Medium
Section Reference: Understanding Application Lifecycle Management
An architect designs the technical blueprint of the system. This includes identifying components and services, their behavior, and how they interact with each other and with the external world.

4. You are planning to develop a new software system for your organization. Someone needs to be responsible for developing system manuals and help files. Which of the following participants should you identify for this task?
a) user interface designer
b) content developer
c) user interface designer
d) technical writer

Answer: d
Difficulty: Medium
Section Reference: Understanding Application Lifecycle Management
Identify a technical writer for this task. Technical writers develop the system manuals and help files that will be delivered with the application.

5. You are planning to develop a new software system for your organization. You need to verify that the implementation of the system matches with the requirements of the system. Which of the following activities would accomplish this requirement?
a) testing
b) design
c) release
d) requirements analysis

Answer: a
Difficulty: Medium
Section Reference: Understanding Application Lifecycle Management
Use the testing activity to assure the quality of the final product. Testing can identify possible gaps between the system expectations described in the requirements document and actual system behavior.

6. You are planning to develop a new software system for your organization. You need to review the plan for packaging, deployment, delivery, and support for the software. Which of the following should you contact?
a) quality assurance manager
b) release manager
c) technical architect
d) database administrator

Answer: b
Difficulty: Medium
Section Reference: Understanding Application Lifecycle Management
Release management includes activities such as packaging and deploying the software, managing software defects, and managing software change requests. The release manager coordinates various teams and business units to ensure timely release of a software product.

7. You are in the process of developing a new software application. As defects are reported, you take the necessary steps to fix them. You need to make sure that each new fix doesn't break anything that was previously working. Which type of testing should you use?
a) integration testing
b) system testing
c) acceptance testing
d) regression testing

Answer: d
Difficulty: Medium
Section Reference: Understanding Testing
As the defects in a software application are reported and fixed, you need to make sure that each new fix doesn't break anything that was previously working. This is where regression testing comes in handy. With every new fix, software testers usually run a battery of regression tests to make sure that every function that was already known to work correctly is still working.

8. You have completed developing a new software application. To ensure the quality of the software, you need to verify that each method or function has proper test cases available. Which testing approach should you use?
a) white-box testing
b) black-box testing
c) alpha testing
d) beta testing

Answer: a
Difficulty: Medium
Section Reference: Understanding Testing
Black-box testing treats the software as a "black box," focusing solely on inputs and outputs. On the other hand, white-box testing is used to make sure that each method or function has proper test cases available. Alpha and beta testing are both black-box types of testing.

9. You have completed developing several major features of a new software application. You plan to provide an early look at the product to important customers to gather some early feedback. Your application still misses features and you haven't yet optimized the application for performance and security. Which kind of testing should you perform with a limited number of important customers?
a) white-box testing
b) black-box testing
c) alpha testing
d) beta testing

Answer: c
Difficulty: Medium

Section Reference: Understanding Testing
Alpha testing—performed by a limited group of users—provides opportunities to give the most important customers an early look at the product and to gather feedback. Alpha releases may miss some features and generally lack many nonfunctional attributes such as performance. In the next level of testing, beta testing, you release the product to a wider audience of customers and solicit feedback. In terms of functionality, the beta release of the software is very close to the final release. However, the development teams might still be working on improving performance and fixing known defects.

10. You are developing a new application that optimizes the processing of a manufacturing plant's operations. You need to implement a data structure that works as a "buffer" for overflow capacity. When the manufacturing capacity is available, the items in the buffer need to be processed in the order in which they were added to the buffer. Which data structure should you use to implement such buffer?
a) array
b) linked list
c) stack
d) queue

Answer: d
Difficulty: Medium
Section Reference: Understanding Data Structures
In a queue, items are processed in the order in which they were added to the queue. In particular, items are always added at the end of the queue and removed from the front of the queue. This is also commonly known as first-in, first-out (FIFO) processing.

11. You are developing a new application that optimizes the processing of a warehouse's operations. When the products arrive, they are stored on warehouse racks. To minimize the time it takes to retrieve an item, the items that arrive last are the first to go out. You need to represent the items that arrive and leave the warehouse in a data structure. Which data structure should you use to represent this situation?
a) array
b) linked list
c) stack
d) queue

Answer: c
Difficulty: Medium
Section Reference: Understanding Data Structures
A *stack* is a collection of items in which the last item added to the collection is the first one to be removed.

12. You are developing an application that uses a double dimensional array. You use the following code to declare the array:

```
int[,] numbers = new int[,]
{
   { 11, 7, 50, 45, 27  },
   { 18, 35, 47, 24, 12 },
   { 89, 67, 84, 34, 24 },
   { 67, 32, 79, 65, 10 }
};
```

Next, you refer to an array element by using the expression numbers[2, 3]. What will be the return value of this expression?
a) 47
b) 84
c) 24
d) 34

Answer: d
Difficulty: Medium
Section Reference: Understanding Arrays
In the .NET Framework, all arrays are zero-based. A two-dimensional array can be thought of as a table in which each cell is an array element and can be addressed using the numbers of the row and column to which it belongs. Both the row number and column number are indexed by zero. For example, the expression number[2, 3] would refer to an item in the third row and fourth column of an array, which in this case is 34.

13. In your application, you are using a queue data structure to manipulate information. You need to find whether a data item exists in the queue, but you don't want to actually process that data item yet. Which of the following queue operations will you use?
a) enqueue
b) dequeue
c) peek
d) contains

Answer: d
Difficulty: Medium
Section Reference: Understanding Queues
The contains operation allows you to determine whether a particular item exists in the queue. The peek operation allows you to look at the current item at the head position without actually removing it from the queue. The enqueue operation adds an item to the tail end of the queue. The dequeue operation removes the current element at the head of the queue.

14. You are developing an application that uses the Stack data structure. You write the following code:

```
Stack first = new Stack();
first.Push(50);
first.Push(45);
first.Pop();
first.Push(11);
first.Pop();
first.Push(7);
```

What are the contents of the stack, from top to bottom, after these statements are executed?

a) 7, 11, 50
b) 7, 45
c) 7, 50
d) 7, 11, 45

Answer: c
Difficulty: Medium
Section Reference: Understanding Stacks
After the first statement, the content of the stack is (50). After the second statement, the stack contents from top to bottom are (45, 50). After the third statement, the top element is popped, resulting to (50). After the fourth statement, another element is added to the top, resulting to (11, 50). After the fifth statement, the top element is popped, resulting to (50). Finally, the sixth statement is executed and the result of stack is (7, 50).

15. In your application, you are using a stack data structure to manipulate information. You need to find which data item will be processed next, but you don't want to actually process that data item yet. Which of the following queue operations will you use?

a) pop
b) push
c) peek
d) contains

Answer: c
Difficulty: Medium
Section Reference: Understanding Stacks
The peek operation allows you to look at the current item at the top of the stack without actually removing it. The contains operation allows you to determine whether a particular item exists in the stack. The push operation adds an item to the top of the stack. The pop operation removes the element at the top of the stack.

16. You are developing a sorting algorithm that uses partitioning and comparison to arrange an array of numbers in the correct order. You write a method that partitions the array so that the

items less than pivot go to the left side, whereas the items greater than pivot go to the right side. The partitioning method has the following signature:

```
static int Partition (int[] numbers, int left,
  int right, int pivotIndex)
```

Which of the following algorithms should you use to sort the array using the Partition method?

a)
```
static int[] QuickSort(int[] numbers,
      int left, int right)
{
   if (right > left)
   {
      int pivotIndex = left + (right - left) / 2;
      pivotIndex = Partition(
         numbers, left, right, pivotIndex);
      QuickSort(
         numbers, left, pivotIndex - 1);
      QuickSort(
         numbers, pivotIndex + 1, right);
   }
   return numbers;
}
```

b)
```
static int[] QuickSort(int[] numbers,
      int left, int right)
{
   if (right > left)
   {
      int pivotIndex = left + (right - left) / 2;
      pivotIndex = Partition(
         numbers, left, right, pivotIndex);
      QuickSort(
         numbers, left, pivotIndex);
      QuickSort(
         numbers, pivotIndex + 1, right);
   }
   return numbers;
}
```

c)
```
static int[] QuickSort(int[] numbers,
      int left, int right)
{
   if (right > left)
   {
```

```
            int pivotIndex = left + (right - left) / 2;
            pivotIndex = Partition(
               numbers, left, right, pivotIndex);
            QuickSort(
               numbers, left, pivotIndex - 1);
            QuickSort(
               numbers, pivotIndex, right);
         }
         return numbers;
      }
```

d)
```
      static int[] QuickSort(int[] numbers,
           int left, int right)
      {
         if (right > left)
         {
            int pivotIndex = left + (right - left) / 2;
            pivotIndex = Partition(
               numbers, left, right, pivotIndex);
            QuickSort(
               numbers, left, pivotIndex + 1);
            QuickSort(
               numbers, pivotIndex + 1, right);
         }
         return numbers;
      }
```

Answer: a
Difficulty: Medium
Section Reference: Understanding QuickSort
After you partition the array, you need only to sort the left and right sides of the array. The middle element is automatically sorted. To sort the left array, use the expression QuickSort(numbers, left, pivotIndex - 1); to sort the right array, you should use the expression QuickSort(numbers, left, pivotIndex + 1).

17. You are studying various sorting algorithms to understand, analyze, and compare the various sorting techniques. Which of the following techniques should you utilize when using the BubbleSort algorithm?
a) comparison
b) comparison and swap
c) comparison and partition
d) partition and swap

Answer: b

Difficulty: Medium
Section Reference: Understanding Sorting Algorithms
The BubbleSort algorithm uses a series of comparison and swap operations to arrange list elements in the correct order.

18. You are developing a C# program that makes use of a singly linked list. You need to traverse all nodes of the list. Which of the following items will you need to accomplish this requirement?
a) link to the head node
b) link to the tail node
c) data in the head node
d) data in the tail node

Answer: a
Difficulty: Medium
Section Reference: Understanding Linked Lists
Each node in a linked list contains of two pieces of information: the data corresponding to the node, and the link to the next node. The first node of the list is called the head node. Using this link, you can get to the next node and continue traversing nodes until the final link is a null value.

19. Which of the following is not true about linked lists?
a) A linked list does not allow random access to its items.
b) A link to the head node can help you locate all the nodes in a linked list.
c) The items in a linked list must be stored in contiguous memory locations.
d) Linked lists are extremely fast in performing insert and delete operations.

Answer: c
Difficulty: Medium
Section Reference: Understanding Linked Lists
A linked list is a collection of nodes in which each node contains a reference (or link) to the next node in the sequence. Unlike in an array, items in a linked list need not be contiguous; therefore, a linked list does not require reallocation of memory space for the entire list when more items must be added.

20. You are developing a program that performs frequent insert and delete operations on the data. Your requirement also dictates the capability to access previous and next records when the user clicks the previous or next button. Which of the following data structures will best suit your requirements?
a) array
b) circular linked list
c) linked list
d) oubly linked list

Answer: d

Difficulty: Medium
Section Reference: Understanding Linked Lists
Because you need to perform frequent insert and delete operations, using a linked list is better than using arrays. Also, because you need access to both previous and next records, you must use a doubly linked list. The linked list and circular linked list let you traverse in only one direction.